

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Appln. Of: COPE, David                          Group: 2835  
Serial No.: 10/634,434                          Examiner: Rutland Wallis,  
Michael  
Filed: August 5, 2003                          Confirmation No. 8296  
For: Self-powered Direct Current Mitigation Circuit for Transformers  
DOCKET: EMI.1002                          Appeal No.:

Mail Stop Appeal Brief-Patents  
Honorable Commissioner for Patents  
Alexandria, Virginia 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief under 37 C.F.R. §1.192 is submitted in support of Patent Examiner's final Office Action, mailed August 23, 2006, finally rejecting pending claims 1-20 of the above referenced application.

AUTHORIZATION TO DEBIT ACCOUNT

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this response. However, in the event that additional extensions of time are necessary to allow consideration of this final response, such extensions are hereby petitioned under 37 C.F.R. § 1.136(a) and any fee required therefore (including fees for net addition of claims) are hereby authorized to be charged to deposit account No. 08-1391.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

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HAYES SOLOWAY P.C.  
130 W. CUSHING ST  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

**I. REAL PARTY IN INTEREST**

The real party in interest of the instant application is Engineering Matters, Inc., the Assignee, which is a Massachusetts Corporation.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## **II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

### III. STATUS OF THE CLAIMS

Claims 1-20 are pending in the application. Claims 1-20 stand finally rejected under 35 U.S.C. § 103(a). The Applicant hereby appeals the foregoing final rejection for claims 1-20.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

#### IV. STATUS OF THE AMENDMENTS

An Amendment was filed on January 18, 2006 amending claims 1, 2, 12, 13, and 17, which also added new claim 20. An Amendment was filed on March 17, 2006 correcting the improper limitations to claims 2 and 12. A Response to the Final Office Action of April 13, 2006 was filed on July 13, 2006, however, no amendments were made to the claims.

Accordingly, the claims attached hereto in Appendix A reflect the amendments mentioned above.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## V. SUMMARY OF CLAIMED SUBJECT MATTER

The Application presently has three pending independent claim, namely, claims 1, 13 and 19.

Claim 1 is directed to a DC mitigation circuit including a control circuit for evaluating an amount of DC current resulting from the DC in a transmission line (at least at paragraph 26 of the original application). Switches controlled by the control circuit provide a current into a winding of a transformer (at least at paragraph 32). The current provided to said winding generates a magnetic flux that offsets a flux created by said DC current resulting from the DC in said transmission line (at least in paragraph 32).

Claim 13 is directed toward a method of performing DC mitigation. One of the steps is evaluating an amount of DC and harmonic current resulting from the DC in a transmission line (at least in paragraph 26). Another step is providing a current into a winding of a transformer based on said evaluated amount of DC and harmonic currents resulting from the DC (at least in paragraph 32). Another step is generating a magnetic flux that offsets a flux created by said DC and harmonic currents resulting from the DC in said transmission line (at least in paragraph 32).

Claim 19 is directed toward a DC mitigation circuit. The DC mitigation circuit includes means for evaluating an amount of DC or harmonic current resulting from the DC in a transmission line (at least in paragraph 26). The DC mitigation circuit also includes means for providing a current into a winding of a

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

transformer, said means for providing a current into said winding being controlled by said means for evaluating (at least in paragraph 32). The current provided to said winding generates a magnetic flux that offsets a flux created by said DC or harmonic current resulting from the DC in said transmission line (at least in paragraph 32).

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issue in this appeal is whether claims 1-20 are patentable over the cited references, with regards to 35 U.S.C. § 103(a).

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

---

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## VII. ARGUMENT

### **A. 35 USC Section 103(a)**

A patent may not be obtained though the invention is not identically disclosed or described as set forth in Section 102 of this title, if the differences sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

### **B. Case Law**

It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must teach, disclose, or suggest, either implicitly or explicitly, all elements/features/steps of the claim at issue. See, e.g., In re Dow Chemical, 5 U.S.P.Q. 2d 1529, 1531 (Fed. Cir. 1988), and In re Keller, 208 U.S.P.Q. 871, 881 (C.C.P.A. 1981).

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

### C. The Examiner's Rejection

It is stated on page 5 of the final office action that:

With respect to claims 1, 13 and 19-20 Kern teaches a DC mitigation circuit (column 3 lines 13-36), comprising: a control circuit (item 40) for evaluating (Kern uses a feedback control loop item 30 and items 32 and 34 to evaluate the DC and harmonics in a transmission line) an amount of DC current resulting from the DC in a transmission line (such as leads 42 and 50). While Kern is silent on the use of switches for providing current into the windings of a transformer, Kern does teach the injection of a current signal by DC offset adjust device item 24 on lead 62 to adjust the DC and the harmonics entering the windings of a transformer. Liu provides a teaching of using switches (Fig. 1 item 10 and 11 solid state switches comprising a IGBT or thyristor switch) for providing a current into a winding of a transformer, in order to mitigate or dampen harmonic frequencies which in turn produce the DC current in the transmission line, wherein the windings of the transformer of Liu generates a magnetic flux that offsets a flux created by said DC or harmonic current resulting from the DC in said transmission line (column 3 line 57 – column 4 line 24). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kern to use an connection to a transformer by

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

switches of Liu to mitigate the DC and harmonics in a transmission line to simplify the device and to provide a clean and level power signal provided to loads.

#### D. References

Kern teaches a control system is provided for positioning between a power source, such as a distributed generator, and a utility or utility grid to control the injection of dc current and even harmonics into the utility or utility grid. In one embodiment, the control system is particularly suited for grid-tied operation and includes a power converter for acting as an ac current source by converting power received from the power source to ac current for transmittal to the utility. The control system further includes a voltage transformer between the power converter and the utility connection to block dc current and isolate the power source from the utility. Kern does not address DC flux in a transformer.

Liu teaches an active filter for filtering the current and improving the power factor of the single-phase overhead contact wire by compensating the odd harmonic frequencies generated and optionally the reactive power consumed by the traction equipment and the auxiliary equipment.

#### E. Remarks

##### 1. The control circuit for evaluating DC current on a transmission line

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

Kern in view of Liu fails to teach, disclose, or suggest a control circuit for evaluating DC current on a transmission line, as required by claims 1 and 13 and the claims that depend therefrom. Liu teaches overhead catenaries for locomotives. Kern teaches distributed generation power conversion. Neither of these patents is directed towards transmission lines. Further, Kern's insertion of a transformer would not be workable for a transmission line arrangement. Its insertion would not be allowed in-line along transmission lines for safety reasons, since a failure could cause unsafe voltage excursions and/or unsafe current amplitudes to occur.

The Applicant has raised this argument previously and the Examiner addressed it in the 8-23-2006 office action at the last paragraph of page 2, which continues to the top of page 3, and the second paragraph of page 5. As the Examiner states, "Kern is concerned with generating power at a source and then supplying the power to a grid or AC loads ... Kern evaluates and mitigates the effects of even harmonics, which in turn cause a DC current, between a power source and a load." Therefore, as explained by the Examiner, Kern is concerned with power and, thereby, current supplied to a transmission line, not evaluating current on a transmission line. Further, Kern evaluates and mitigates one cause of DC current on a transmission line, it does not evaluate and mitigate the DC current on the transmission line.

Kern teaches, in numerous locations within the patent, that the device it discloses is a control system "provided for connection between a power source and a utility and/or ac loads." Col. 3, lines 64-65. The device of Kern has no

HAYES SOLOWAY P.C.  
190 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

means of determining the DC on the transmission line, but simply monitors the DC that a power source may be (at risk of) putting on a transmission line. The Examiner stated in the 4-13-2006 office action that Liu does not disclose this claim limitation. Therefore, Kern in view of Liu fails to teach, disclose, or suggest a control circuit for evaluating DC current on a transmission line.

**2. The current provided to said winding generates a magnetic flux that offsets a flux created by said DC current**

Kern in view of Liu fails to at least teach, disclose, or suggest generating a magnetic flux to offset the flux caused by DC current, as required by claims 1, 13, and 19 and the claims that depend therefrom. Liu is limited to sensing and eliminating harmonic current by applying a voltage across a winding. Kern is directed to correcting and evaluating DC current resulting from load devices and providing an offset to the line to correct DC current. Neither reference teaches or discloses applying a current to a winding to offset a flux created by DC current and neither reference teaches or discloses how to correct DC current originating in the transmission line.

The Applicant has raised this argument previously and the Examiner addressed it in the 8-23-2006 office action at the first full paragraph of page 3, and the second paragraph of page 5. As the Examiner states, referencing item 24 of Kern, "the offset output in the DC offset adjust device or in the converter would have flux as movement of charge is being injected into the power converter to cause the elimination of even ordered harmonics." This is not a magnetic flux offsetting a flux, as claimed. Kern is teaching an offset source that the Examiner speculates would have flux movement

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

offsetting DC from a power source. Neither Kern, nor Liu, nor the Examiner's reading of Kern discloses this limitation of the claimed invention.

### **3. Lack of Motivation to Combine**

Claims 1-20 are rejected based at least on the combination of Liu and Kern. The Applicant submits that one skilled in the art would not combine Kern and Liu as the Examiner is suggesting. More specifically, one having ordinary skill in the art would not utilize the method of treating odd harmonics as taught in Liu as an offset means of Kern to treat DC current. Liu is limited to teaching a means for mitigating odd harmonics. As taught in references, such as US Patent No. 5,691,577 to Smith, the power factor problem generated by AC/DC converters utilizing rectifier bridges are odd harmonics, primarily the 3<sup>rd</sup> and 5<sup>th</sup> harmonics. This is the problem being addressed by Liu. The active filter disclosed in Liu would have absolutely zero impact on DC current in the primary winding 2, as shown in FIG. 1 of Liu. Thus, one skilled in the art would not utilize this active filter to fulfill the DC offset needs of Kern.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## CLAIMS APPENDIX

**Claim 1.** A DC mitigation circuit, comprising:

a control circuit for evaluating an amount of DC current resulting from the DC in a transmission line; and

switches for providing a current into a winding of a transformer, said switches being controlled by said control circuit,

wherein said current provided to said winding generates a magnetic flux that offsets a flux created by said DC current resulting from the DC in said transmission line.

**Claim 2.** The DC mitigation circuit of claim 1, further comprising the control circuit evaluating an amount of harmonic and non-harmonic AC current resulting from the DC in the transmission line.

**Claim 3.** The DC mitigation circuit of claim 1, wherein said DC mitigation circuit is connected to an output filter for filtering an output of said switches.

**Claim 4.** The DC mitigation circuit of claim 1, wherein said control circuit is connected to a primary winding of said transformer.

**Claim 5.** The DC mitigation circuit of claim 1, wherein said control circuit is connected to a secondary winding of said transformer.

**Claim 6.** The DC mitigation circuit of claim 1, wherein said control circuit is connected to a core of said transformer.

**Claim 7.** The DC mitigation circuit of claim 1, wherein said switches are connected to a tertiary winding of said transformer.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

**Claim 8.** The DC mitigation circuit of claim 1, further comprising a capacitor for powering said switches.

**Claim 9.** The DC mitigation circuit of claim 8, further comprising diodes connected across said switches so as to charge said capacitor during a frequency cycle.

**Claim 10.** The DC mitigation circuit of claim 9, wherein said switches are MOSFETs and said diodes are connected across a source and drain of said MOSFET switches so as to carry current in an opposite direction from said MOSFET switches.

**Claim 11.** The DC mitigation circuit of claim 10, wherein said capacitor discharges during said frequency cycle so as to power said MOSFET switches.

**Claim 12.** The DC mitigation circuit of claim 1, further comprising the control circuit evaluating an amount of harmonic and non-harmonic AC current resulting from the DC in the transmission line and wherein said current provided to said winding generates a magnetic flux that offsets a flux created by said DC and harmonic and non-harmonic AC current resulting from the DC in said transmission line.

**Claim 13.** A method of performing DC mitigation, comprising the steps of:

evaluating an amount of DC and harmonic current resulting from the DC in a transmission line;

providing a current into a winding of a transformer based on said evaluated amount of DC and harmonic currents resulting from the DC; and

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

generating a magnetic flux that offsets a flux created by said DC and harmonic currents resulting from the DC in said transmission line.

**Claim 14.** The method of claim 13, wherein said current supplied to said transformer winding is provided by an internal power supply.

**Claim 15.** The method of claim 14, wherein switches are used to control said current that is outputted from said power supply to said transformer winding.

**Claim 16.** The method of claim 15, further comprising the step of filtering said current output from said switches.

**Claim 17.** The method of claim 13, further comprising evaluating an amount of non-harmonic AC current resulting from the DC in a transmission line.

**Claim 18.** The method of claim 13, wherein said switches are integrated gate bipolar transistors (IGBTs).

**Claim 19.** A DC mitigation circuit, comprising:  
means for evaluating an amount of DC or harmonic current resulting from the DC in a transmission line; and

means for providing a current into a winding of a transformer, said means for providing a current into said winding being controlled by said means for evaluating,

wherein said current provided to said winding generates a magnetic flux that offsets a flux created by said DC or harmonic current resulting from the DC in said transmission line.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

**Claim 20.** The DC mitigation circuit of claim 1, wherein the control circuit further evaluates an amount of harmonic current resulting from the DC in the transmission line and wherein said current provided to said winding generates a magnetic flux that offsets a flux created by said harmonic-current resulting from the DC in said transmission line.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## **EVIDENCE APPENDIX**

None submitted by the Applicant and none entered by the Examiner.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

## **RELATED PROCEEDINGS APPENDIX**

No related proceedings exist or existed.

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.882.7623  
FAX. 520.882.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567

**CONCLUSION**

In view of the foregoing, it is respectfully requested that the Examiner's rejection of the subject application be reversed.

Respectfully submitted,



Todd A. Sullivan  
Attorney for Appellant  
Reg. No. 47,117

Customer No. 26,812

**CERTIFICATE OF ELECTRONIC FILING**

I hereby certify that this correspondence is being deposited with the United States Patent Office via the electronic filing procedure on January 22, 2007.

By: Kristine Stevens

HAYES SOLOWAY P.C.  
130 W. CUSHING ST.  
TUCSON, AZ 85701  
TEL. 520.682.7623  
FAX. 520.682.7643

—  
175 CANAL STREET  
MANCHESTER, NH 03101  
TEL. 603.668.1400  
FAX. 603.668.8567